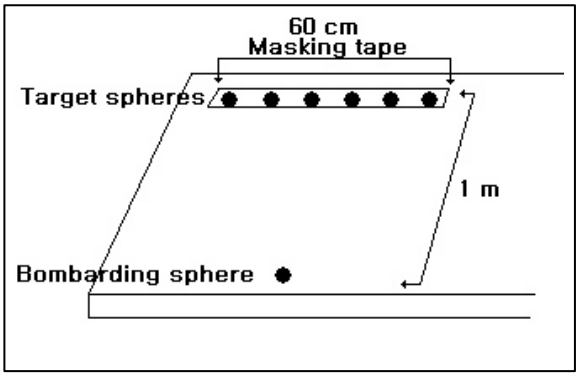
Atomic Radius Lab
AP Physics
26 Points Total
Thanks to Martha Andreski for this lab.

Background: There is much about the atom that we cannot see directly. That does not mean it does not exist or that we are just guessing about the nature or structure of elementary particles or atoms themselves. For several hundred years scientists have developed increasingly sophisticated experiments and testing devices to help us understand the atom.

Purpose: This activity illustrates how one can determine the size of an object without measuring it directly.

Materials: 7 spheres meter stick masking tape



Procedures:

1. Use masking tape to make a line 60 cm long across your lab table. Measure and record the exact length of the line in the table below. Your "field of action" should not have any obstructions.

2. Place 6 spheres along your marked line across its width. Place a sphere at 5.0cm, 15.0cm, 25.0cm, 35.0cm, 45.0cm, 55.0cm

3. Place the remaining sphere about 1 meter away from the targets.

4. Without looking, one partner will roll the single sphere toward the line of spheres. The other partner records a hit or a miss and replaces any hit spheres before the next roll. Continue for 100 trials.

5. Switch partners and repeat step 4.

6. Total the number of trials and the hits for you and your partner. Record these totals in your data table.

7. Collect class data for hits and trials, sum them up with your own totals, and record them.

8. Measure the diameter of the spheres by placing one against a meter stick.

DATA TABLES (fully finished, 4 points each):

	HIT	***MISS***
PARTNER A:		
PARTNER B:		
Total:		

Observations	***Your Data***	***Class Data***
A. Width of field (cm)		
B. Number of target spheres		
C. Total number of hits		
D. Total number of trials		
E. Calculated sphere diameter (cm)		
F. Actual diameter of sphere (measured) (cm)		

Questions:

1. On what does the hit/miss ratio depend (2 points)?
2. Calculate the diameter of your sphere by the formula (2 points): Diameter [Field width (A)] x [Hits (C)]
3. Calculate the "class sphere diameter" and compare (2 points). [2] x [# of target spheres (B)] x [Trials (D)]
4. How would you expect your data to differ if your spheres were twice as large (2 point)? Half as large (2 point)?
5. How does the number of trials affect the results (2 points)?
6. Investigate the Hans Geiger/Ernest Marsden and Rutherford gold foil experiments. What did those experiments prove and what are the similarities between that experiment and the one you just performed (6 points)?